

REMARKS

Claims 1-20 are pending in this application. By this Amendment, claims 1-6 and 9-12 are amended. Support for the amendments to the claims may be found, for example, in the specification, paragraphs [0017]-[0023]. No new matter is added.

I. Claim for Priority

Applicants thank the Examiner for acknowledging Applicants' claim for priority. Applicants respectfully submit the attached Request To Retrieve Electronic Priority Application, requesting the Patent Office to obtain a certified copy of JP 2003-184359. Applicants also respectfully request that the Examiner indicate that a certified copy of JP 2003-184359 has been received in the next Patent Office Communication.

II. Rejections Under 35 U.S.C. §102

The Office Action rejects claims 1-4 and 9-11 under 35 U.S.C. §102(b) over Ucciani et al., "Catalytic Synthesis of 3-Substituted Indoles using CO as Building Block and Supported Rhodium as Catalyst," *Journal of the Chemical Society Chemical Communications*, 82-83 (1981) ("Ucciani"). The Office Action further rejects claims 1-3, 7-10, 13-14, and 17-18 under 35 U.S.C. §102(b) over U.S. Patent No. 3,682,901 to Mohan et al. ("Mohan"). Applicants respectfully traverse the rejections.

By this Amendment, claim 1 recites, *inter alia*, "A process for producing an indole compound... wherein carbon monoxide is used when 2-nitrobenzylcarbonyl compound of formula (1)... is reduced in the presence of a complex catalyst comprising a Group VIII metal of the Periodic Table." Applicants respectfully assert that Ucciani and Mohan fail to disclose at least the above features of claim 1.

Ucciani merely discloses the cyclization of an indole from 2-nitrostyrene (Ucciani (1)) through hydroformylation, using catalysts produced *in situ* from supported rhodium precursors such as Rh/Al₂O₃ and Rh/C. See Ucciani, Scheme on page 82. Ucciani further

discloses that regardless of the conditions, precursors and complexes such as $\text{RhCl}(\text{PPh}_3)_3$ and $\text{RhCl}(\text{CO})(\text{PPh}_3)_2$ lead to a low conversion of 2-nitrostyrene (Ucciani (1)), and that clusters such as $\text{Rh}_4(\text{CO})_{12}$ and $\text{Rh}_6(\text{CO})_{16}$ are quite ineffective. Id. Furthermore, Ucciani only discloses using carbon monoxide in the catalytic conversion of 2-nitrostyrene (Ucciani (1)) to 2-nitroaldehyde (Ucciani (2)), but Ucciani does not disclose using carbon monoxide in the subsequent conversion of 2-nitroaldehyde (Ucciani (2)) to 2-aminoaldehyde (Ucciani (3)) and skatol (Ucciani (4)). Id. Thus, Ucciani fails to disclose producing an indole compound through the reduction of 2-nitrobenzylcarbonyl compound of claimed formula (1) wherein carbon monoxide is used in the presence of a complex catalyst comprising a Group VIII metal of the Periodic Table, as recited in claim 1. For at least this reason, Ucciani does not anticipate claim 1.

Also, Ucciani merely at most discloses rhodium catalysts. Thus, Ucciani fails to disclose the use of the complex catalysts, as recited in at least dependent claims 3, 4, and 5, which do not recite rhodium. Thus, Ucciani does not anticipate at least claims 3, 4, and 5.

Additionally, Mohan merely discloses a process for producing indoles using a catalyst comprising a noble metal and a Lewis acid. For example, Mohan discloses palladium supported on carbon and ferric chloride. See Mohan, col. 3, lines 44-47 and col. 4, lines 37-41. Applicants respectfully assert that a noble metal-Lewis acid combination does not disclose a complex catalyst comprising a Group VIII metal of the Periodic Table, as recited in claim 1. Thus, Mohan fails to disclose producing an indole compound through reduction of 2-nitrobenzylcarbonyl wherein carbon monoxide is used in the presence of a complex catalyst comprising a Group VIII metal of the Periodic Table, as recited in claim 1.

Therefore, for at least the reasons stated above, Ucciani and Mohan fail to disclose each and every feature of amended claim 1. Claims 2-4, 7-11, 13-14, and 17-18 variously

depend from claim 1 and, thus, also are not anticipated by Ucciani or Mohan. Accordingly, reconsideration and withdrawal of the rejections are respectfully requested.

III. Rejections Under 35 U.S.C. §103

The Office Action rejects claims 1-20 under 35 U.S.C. §103(a) over Ucciani or Mohan, as applied to claim 1 above, in view of Richard J. Sundberg, *The Chemistry of Indoles*, 176-77 (1970) ("Sundberg"), Cenini et al., *Catalytic Reductive Carbonylation of Organic Nitro Compounds* 177-246, (1997) ("Cenini"), and Tafesh et al., "A Review of the Selective Catalytic Reduction of Aromatic Nitro Compounds into Aromatic Amines, Isocyanates, Carbamates, and Ureas Using CO," *Chemical Reviews* 2035-2052, (1996) ("Tafesh"). Applicants respectfully traverse the rejections.

A. Ucciani

As discussed above, Ucciani does not disclose each and every feature of amended claim 1. Ucciani merely discloses indole formation using catalysts produced *in situ* from supported rhodium precursors such as Rh/Al₂O₃ and Rh/C. Ucciani further discloses that regardless of the conditions, precursors and complexes such as RhCl(PPh₃)₃ and RhCl(CO)(PPh₃)₂ lead to a low conversion of 2-nitrostyrene, and clusters such as Rh₄(CO)₁₂ and Rh₆(CO)₁₆ are quite ineffective. See Ucciani, page 82. Thus, Ucciani provides no reason or rationale for one of ordinary skill in the art to have reduced 2-nitrobenzylcarbonyl using carbon monoxide and a complex catalyst comprising a Group VIII metal of the Periodic Table to produce an indole compound, as recited in claim 1. For at least this reason, Applicants assert that claim 1 would not have been rendered obvious by Ucciani.

B. Mohan

For at least the reasons as discussed above, Mohan does not disclose each and every feature of claim 1. Further, Mohan provides no reason or rationale for one of ordinary skill in the art to have produced an indole compound through reduction of a 2-nitrobenzylcarbonyl

compound of formula (1) in the presence of a complex catalyst comprising a Group VIII metal of the Periodic Table, as recited in claim 1. Thus, Applicants respectfully assert that use of the claimed complex catalyst would not have been rendered obvious by Mohan.

C. Sundberg, Cenini, Tafesh

Applicants further assert that Sundberg, Cenini, and Tafesh, individually or in combination, fail to address the above discrepancies of Ucciani and Mohan as to claim 1. Sundberg merely discloses production of an indole through a base-catalyzed condensation reaction followed by a reductive cyclization reaction. See Sundberg, page 176, last full paragraph. Thus, Sundberg provides no reason or rationale for one of ordinary skill in the art to have modified Ucciani or Mohan to have produced an indole compound through reduction of a 2-nitrobenzylcarbonyl compound of formula (1) in the presence of carbon monoxide and a complex catalyst comprising a Group VIII metal of the Periodic Table, as recited in claim 1.

Further, Cenini merely discloses the synthesis of indoles by using transition metal carbonyls as catalysts such as $\text{Fe}(\text{CO})_5$, $\text{Ru}_3(\text{CO})_{12}$, and $\text{Rh}_6(\text{CO})_{16}$. See Cenini, page 183, last paragraph. Cenini also discloses that use of these catalysts show indole yields ranging from 18.1% to 74.9%, but with notable amounts of by-product in each experiment. See Cenini, page 185, Table 3. Cenini further discloses use of $\text{PdCl}_2(\text{PPh}_3)_2$ supported by SnCl_2 as a catalyst, with indole yields from 18% to 75%, but that the combination of $\text{PdCl}_2(\text{PPh}_3)_2$ and SnCl_2 was essential for catalytic activity. See Cenini, page 189, last paragraph and Table 4.

In contrast to Cenini, the Examples of the present specification show that reduction of 2-nitrobenzylcarbonyl in the presence of carbon monoxide and a complex catalyst comprising a Group VIII metal of the Periodic Table, as recited in claim 1, produces desired indole compound yields of up to 97%, with little to no by-products. See specification, paragraph [0037]-[0054]. In view of the above data, Applicants respectfully assert that indole formation

using carbon monoxide and a complex catalyst to reduce 2-nitrobenzylcarbonyl of formula (1), as recited in claim 1, achieves improved and unexpected results when compared to the indole yield and by-product formation disclosed in Cenini. Furthermore, the complex catalyst recited in claim 1 does not require support from SnCl_2 for catalytic activity. Thus, Applicants respectfully assert that use of the claimed carbon monoxide and complex catalyst comprising a Group VIII metal of the periodic table to reduce 2-nitrobenzylcarbonyl of formula (1) would not have been rendered obvious by Cenini.

Furthermore, Tafesh discloses indole preparation using $\text{PdCl}_2(\text{PPh}_3)_2/\text{SnCl}_2$, $\text{Fe}(\text{CO})_5$, $\text{Ru}_3(\text{CO})_{12}$, and $\text{Rh}_6(\text{CO})_{16}$, or $\text{Pd}(\text{TMB})_2/\text{TMPhen}$ (2,4,6-trimethylbenzoic acid/3,4,7,8-tetramethyl-1,10-phenanthroline) as catalyst. See Tafesh, page 2048, second column. However, the disclosure of Tafesh is merely a restatement of the data disclosed by Cenini. See Tafesh, pages 2051-2052, fn. 116, 117, and 119, and Cenini, page 244, fn. 26, 35, and 36. Thus, for at least the same reasons as stated above regarding Cenini, Tafesh would not have rendered the process of claim 1 obvious.

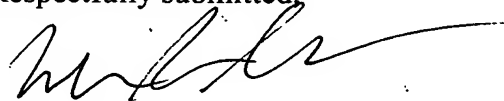
Accordingly, claim 1 would not have been rendered obvious by Ucciani or Mohan in view of Sundberg, Cenini, and Tafesh, individually or in combination. Claims 2-20 depend from claim 1 and, thus, also would not have been rendered obvious by Ucciani or Mohan in view of Sundberg, Cenini, and Tafesh, individually or in combination. Therefore, reconsideration and withdrawal of the rejection are respectfully requested.

IV. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-20 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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Attachment:

Request To Retrieve Electronic Priority Application

Date: June 24, 2009

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